

Bettis XTE3000

Electric Actuator



Revision Details

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Section 1: General Safety Instructions

This troubleshooting guide is applicable to XTE3000 Multi-turn Electric Actuators, which are designed to operate any kind of industrial valves for use in heavy industrial, chemical, petrochemical, food, water, and power generating plants.

Bettis will not be liable for any possible damage or physical injury resulting from use in other than the designated application or by lack of care during installation, operation, adjustment and maintenance of the machinery. Such risks lie entirely with the user.

Depending on the specific working conditions, additional precautions may be required.

NOTICE

This Service Manual gives basic information regarding troubleshooting of XTE3000; detailed information for setting and control of the Electric Actuator part XTE3000 are included on the MAN-02-04-97-0713.

WARNING

It is assumed that the installation, the setting, the commissioning, and the maintenance and repair works are carried out by qualified personnel and checked by responsible specialists.

WARNING

The actuator is non-intrusive. The control compartment was sealed in dry and clean conditions and contains no site serviceable components. Do not open it unless absolutely necessary. Unauthorized access will invalidate the warranty.

WARNING

Since the control and terminal board compartments contain a 9 V and 3.6 V lithium batteries, only open it in safe area. If the actuator is located in a hazardous area, a “hot work” permit must be obtained unless the actuator can be moved to a non-hazardous area.

WARNING

Do not electrically operate the XTE3000 when the electrical enclosures are removed. Operating the unit or working on the electronics with the electrical enclosures removed could cause personal injury.

Section 2: Troubleshooting

The XTE3000 actuator has passed the functional test performed by Bettis Quality Assurance personnel. If the actuator does not work before troubleshooting, make sure that:

1. The main supply voltage is the same as stated in the nameplate menu.
2. The numeric display indicates the position of actuator in percentage xx %.
3. The local selector is in LOCAL or REMOTE.
4. Move the local selector to OFF and check that the alphanumeric display shows one of the following messages:
 - “NORMAL OFF”
 - “ALARM OFF”
 - “WARNING OFF”
 - “ESD ON OFF”
 - “INT OFF”

If the status is ESD ON or INT, an ESD or Interlock command is present. Check the electrical signals on ESD and Interlock terminals and check the ESD and Interlock settings (see Installation, Operation and Maintenance Manual, MAN-02-04-97-0713 and electrical diagram).

If the status is ALARM or WARNING use local display to view the type of alarm or warning.

Figure 1

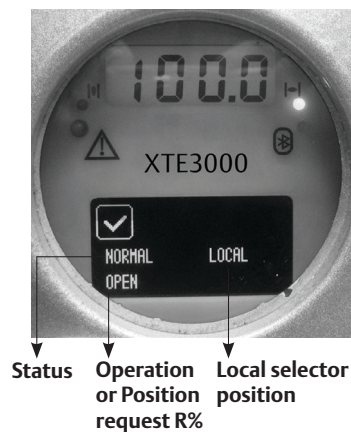
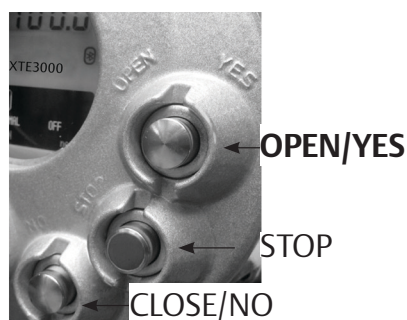


Figure 2



2.1 Alarms and Warnings

Warning is the condition that occurs when a variable reaches a critical value and/or when a maintenance action is required but all actuator functions are still available. The flashing of the alarm/warning LED indicates a warning condition.

Alarm is the condition that occurs when a variable is outside the acceptable range and some actuator function is not available. If the alarm/warning LED is on and fixed there is an alarm condition. When the fault condition disappears, the corresponding alarm or warning also disappears from the list.

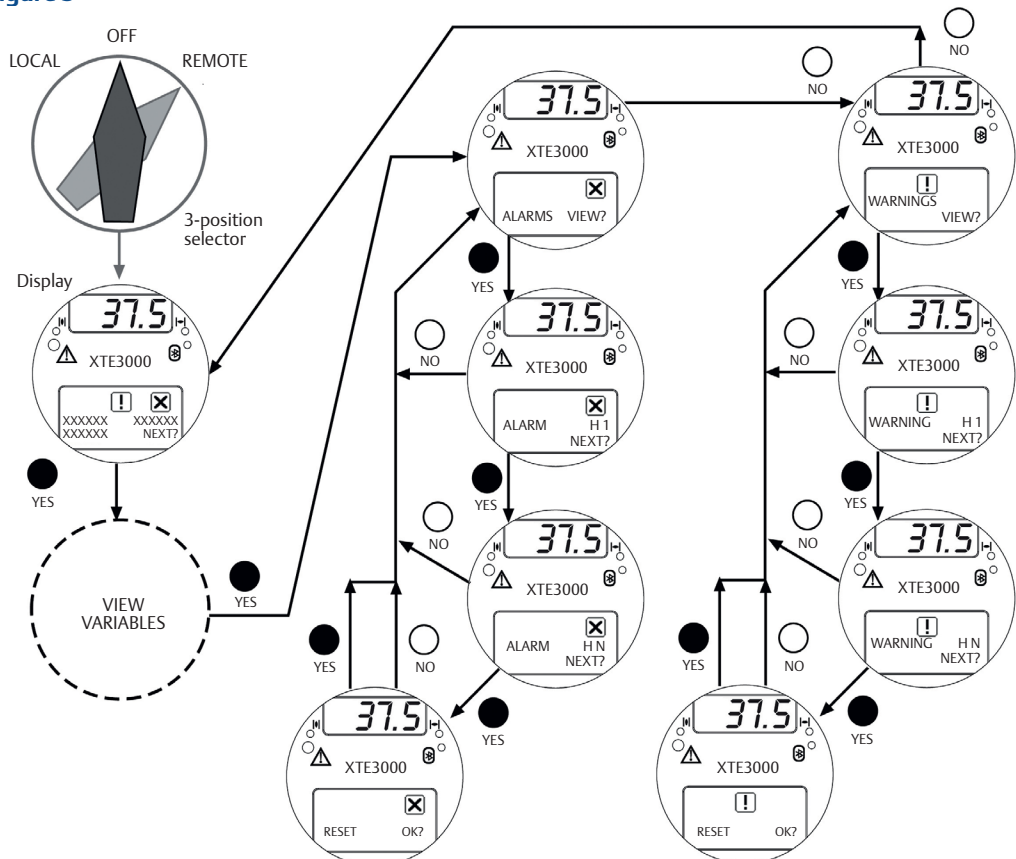
A reset routine is provided in the local menu to clear the types of alarms and warnings that are memorized (over-torque, jammed valve, etc.) (see Installation, Operation and Maintenance Manual, MAN-02-04-97-0713).

View procedure:

1. Move the 3-position selector to either OFF or REMOTE, then press NO to scroll the list of available variables.
2. Press YES when the display shows message "ALARMS view?" Press YES to scroll the list of alarms.
3. Press NO when the display shows message "ALARMS view?"
4. Press YES when the display shows message "WARNINGS view?" Press YES to scroll the list of warnings.
5. Press YES to reset the alarms or warnings with memory.

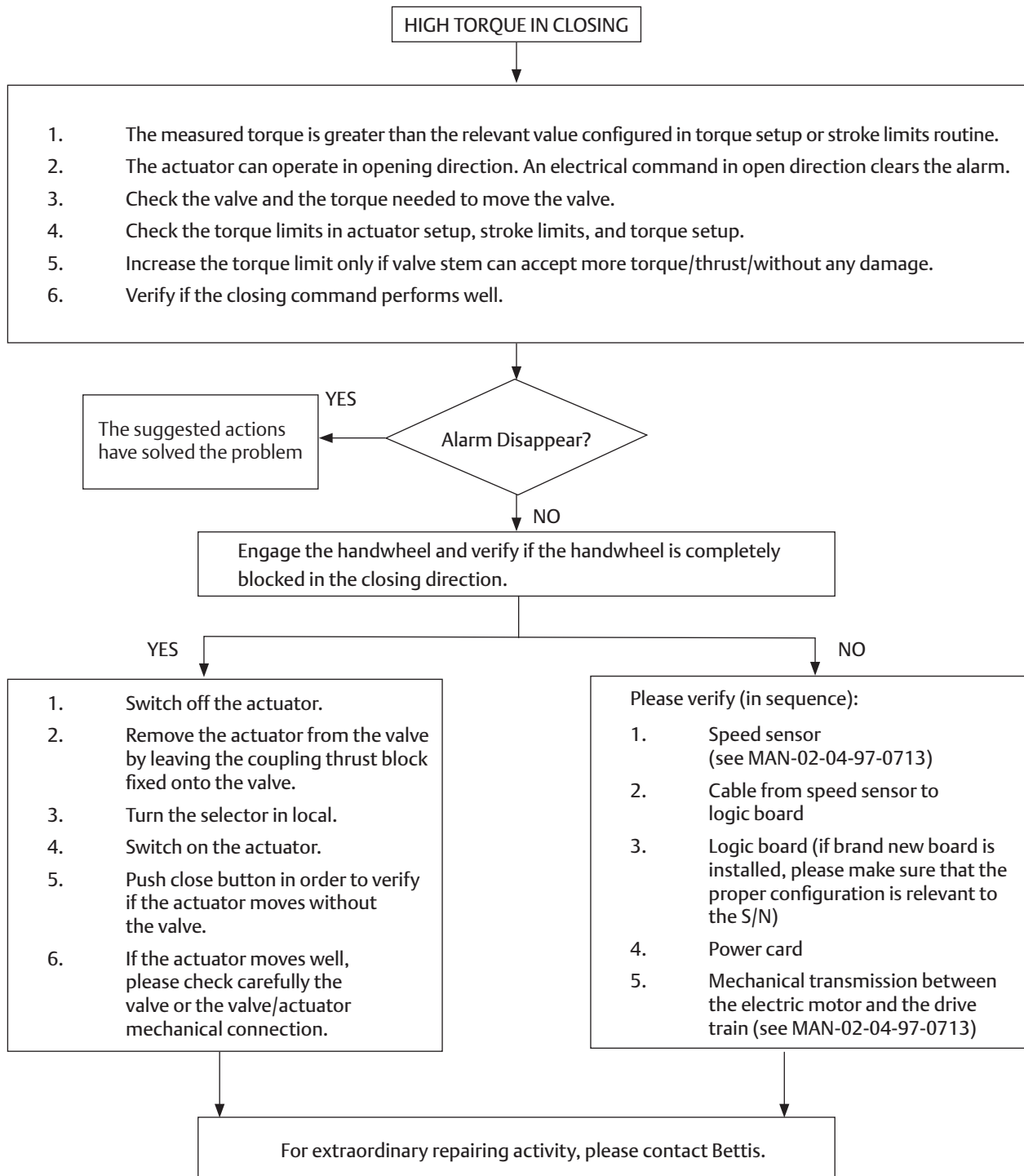
Figure 3 shows the procedure to view the alarms or warnings detected by the electronics.

Figure 3

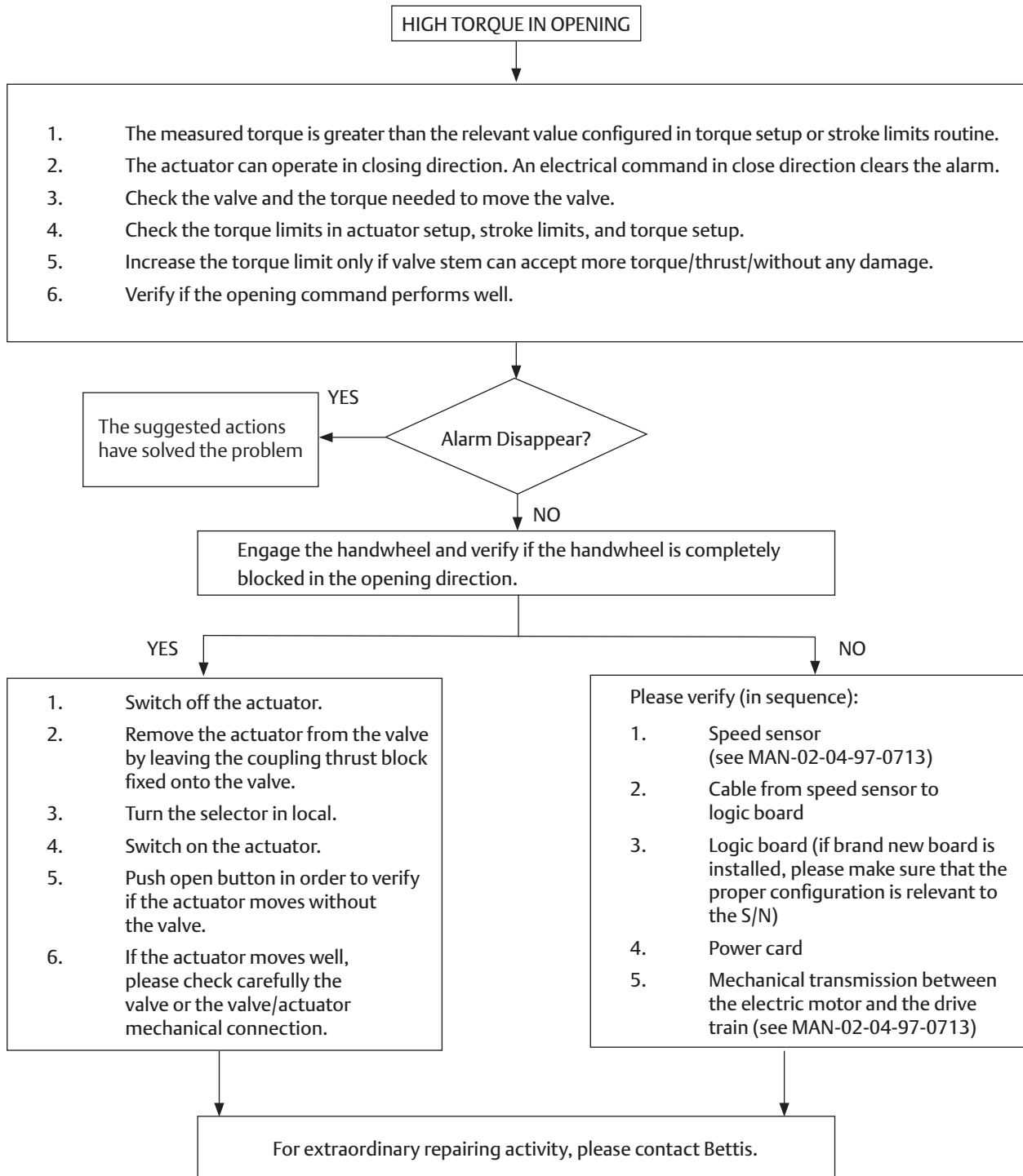


2.2 Alarm Description

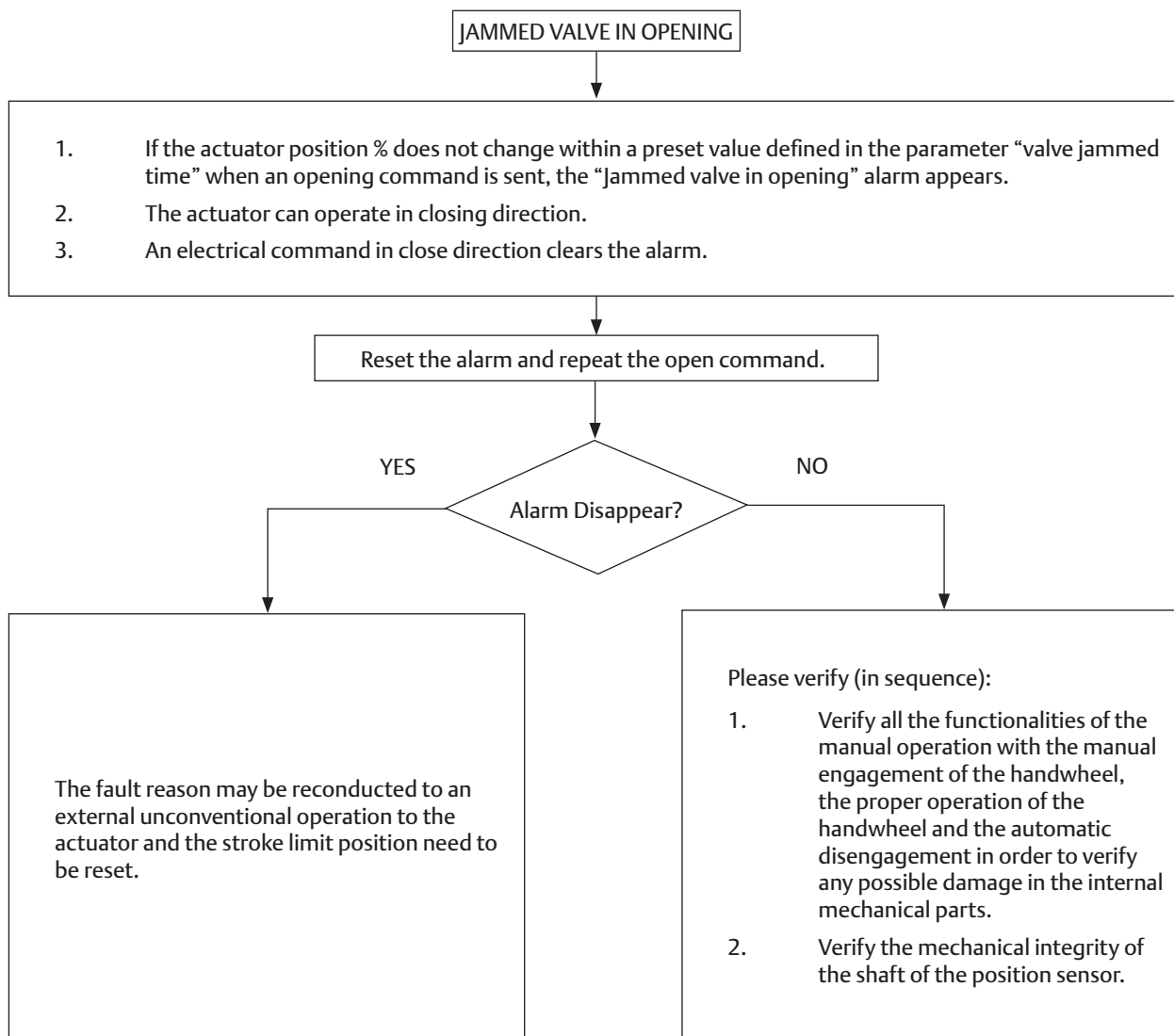
2.2.1 Alarm on Local Display: High Torque in Closing



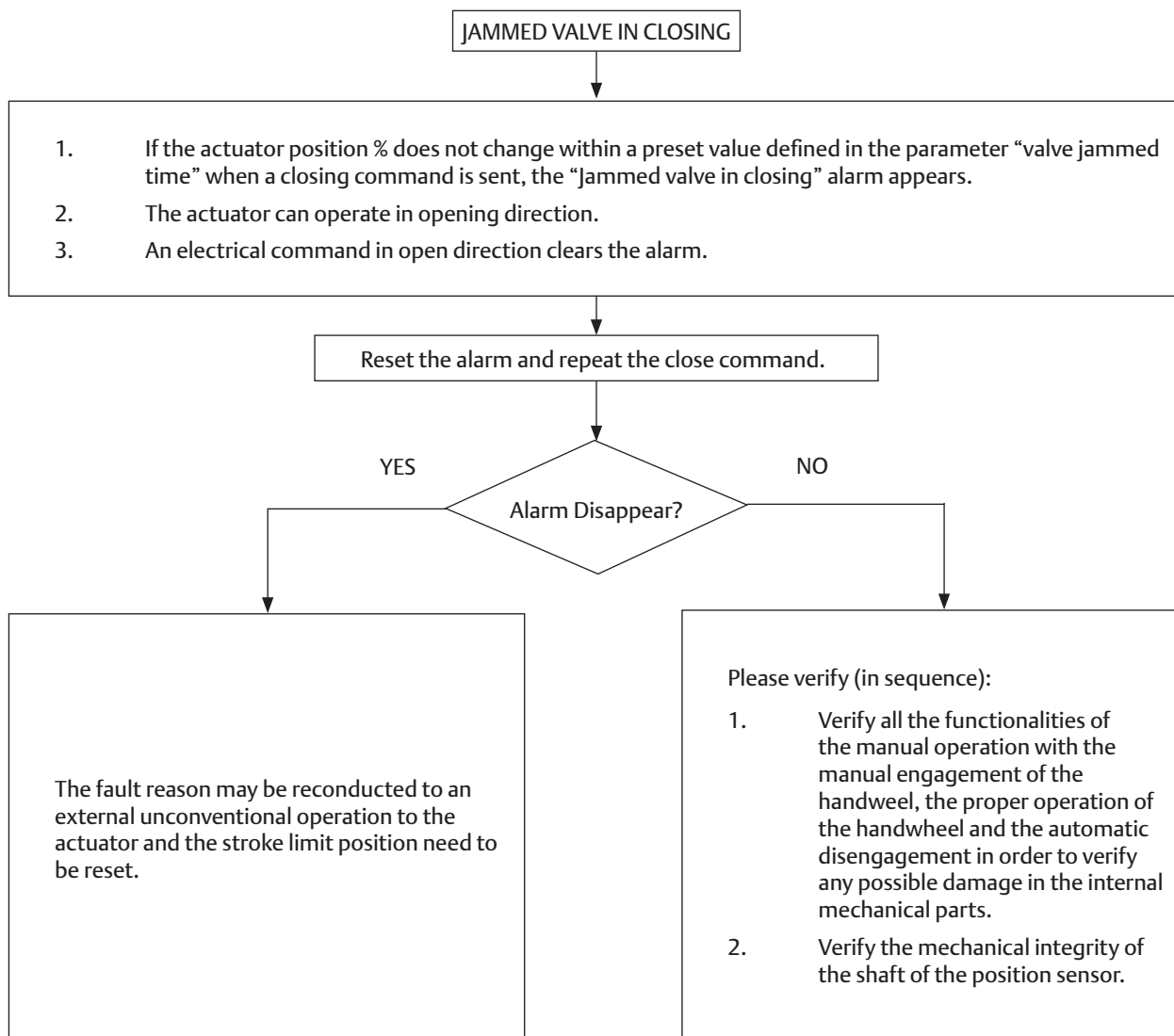
2.2.2 Alarm on Local Display: High Torque in Opening



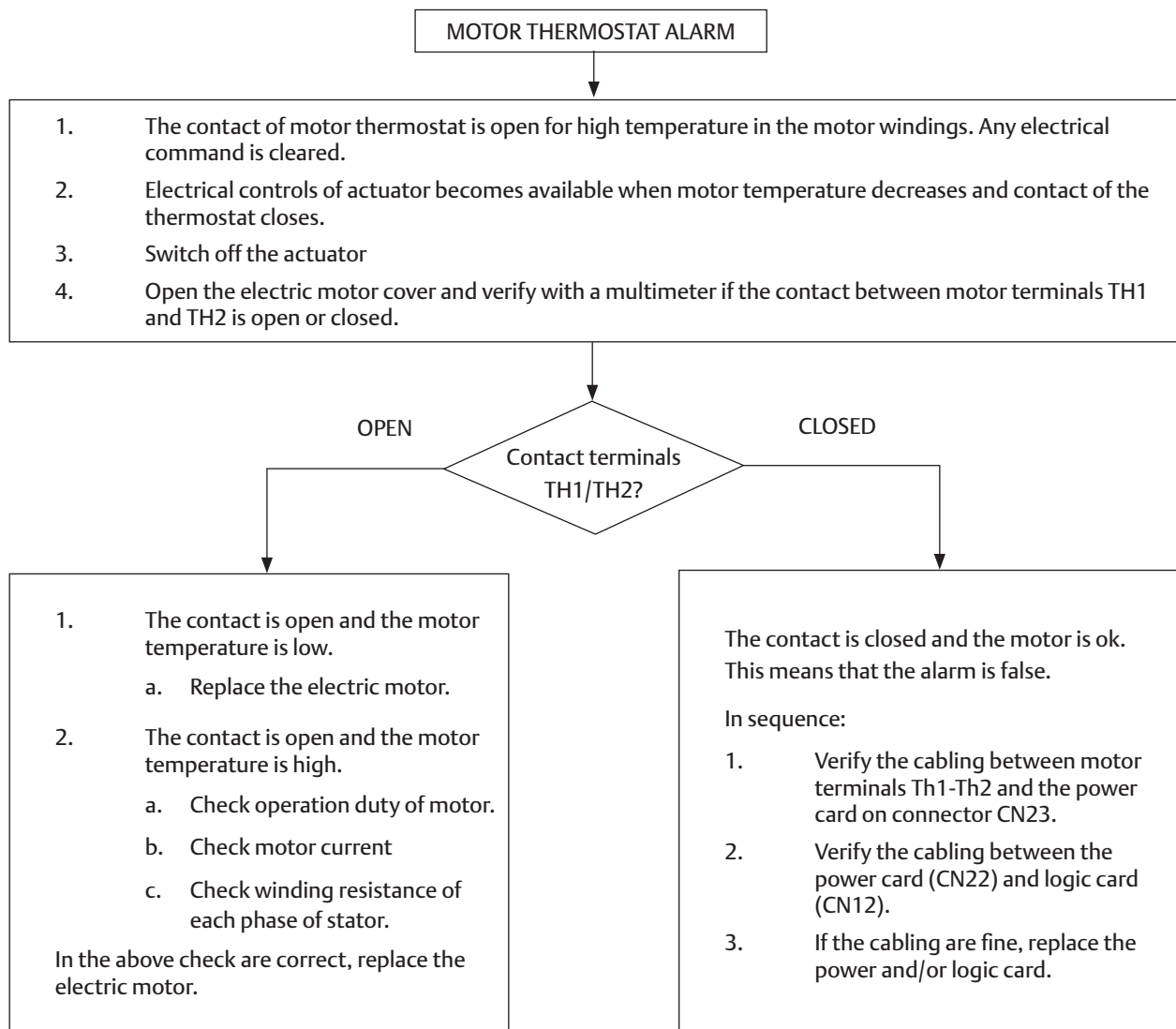
2.2.3 Alarm on Local Display: Jammed Valve in Opening



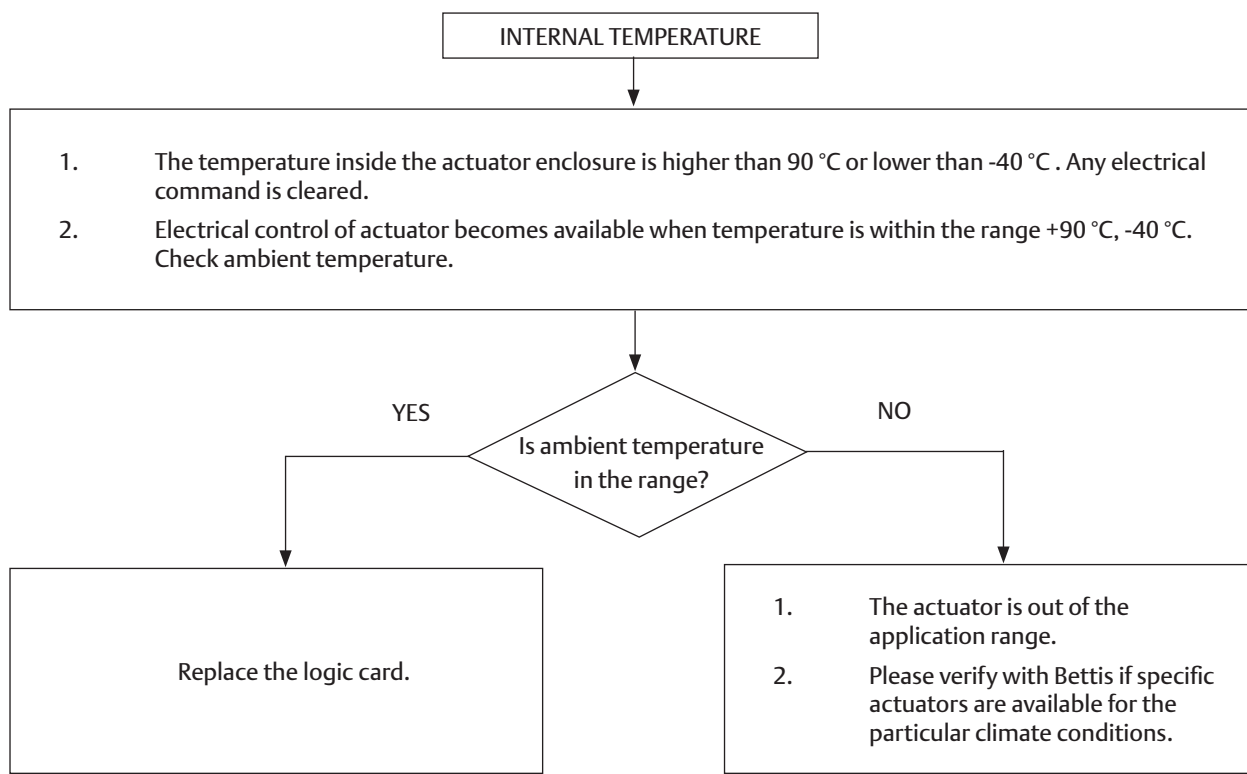
2.2.4 Alarm on Local Display: Jammed Valve in Closing



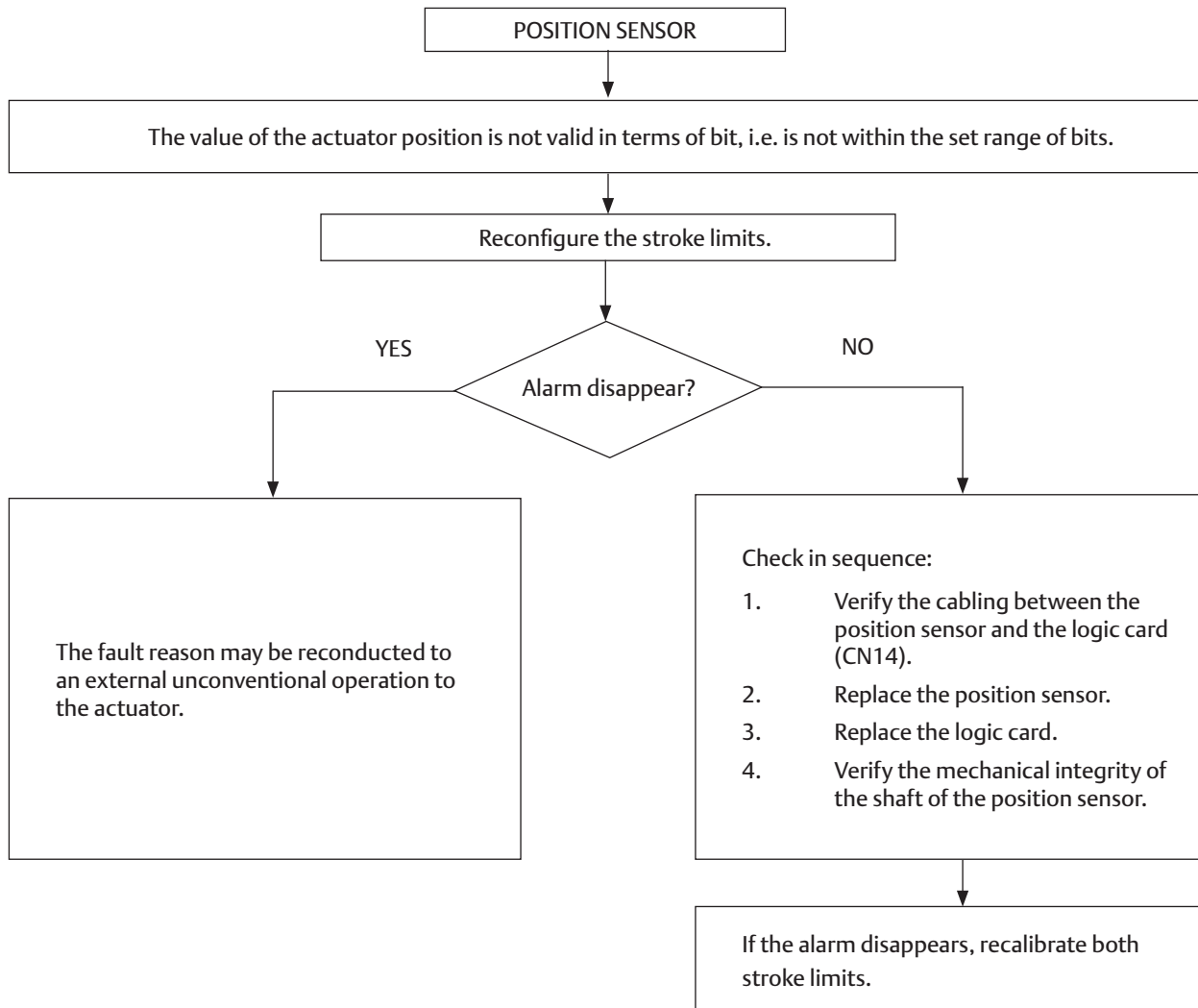
2.2.5 Alarm on Local Display: Motor Thermostat



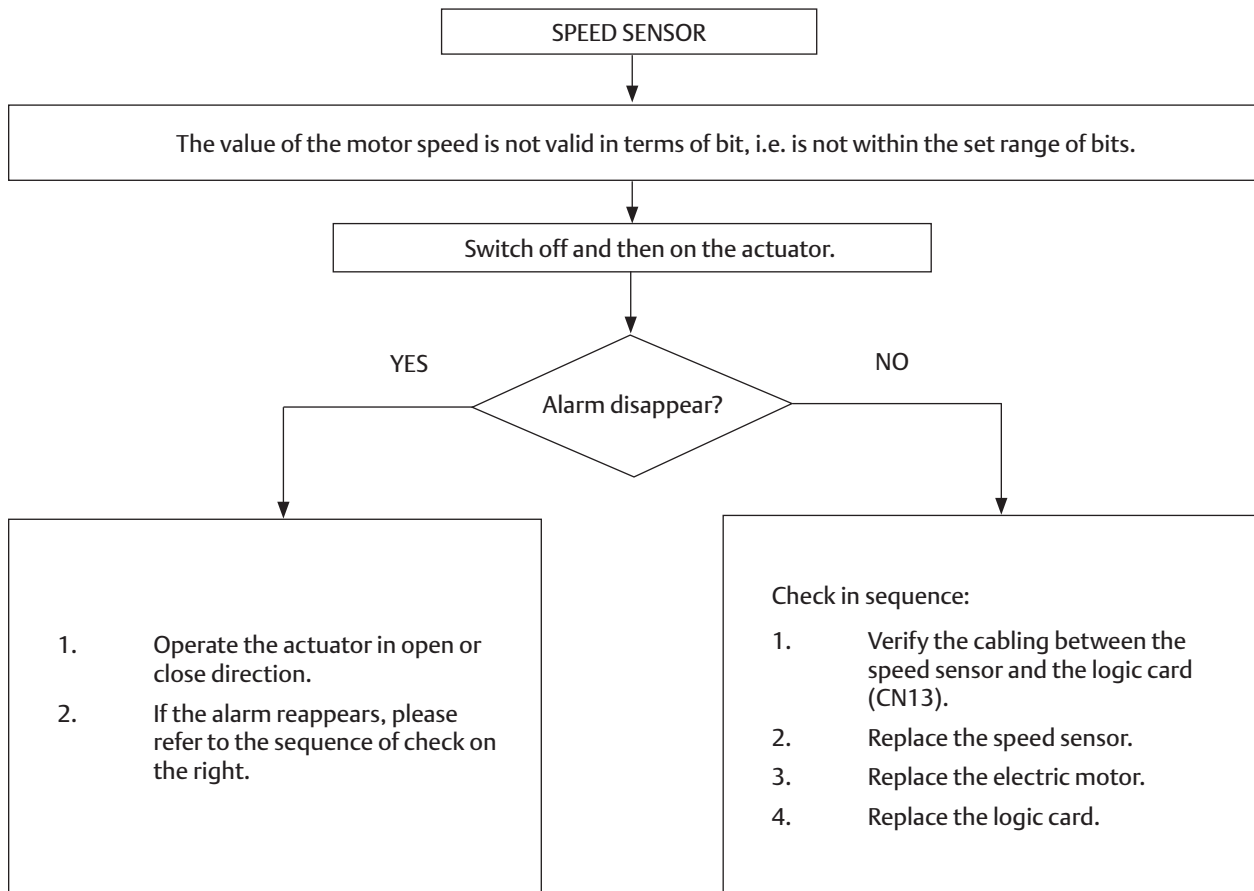
2.2.6 Alarm on Local Display: Internal Temperature



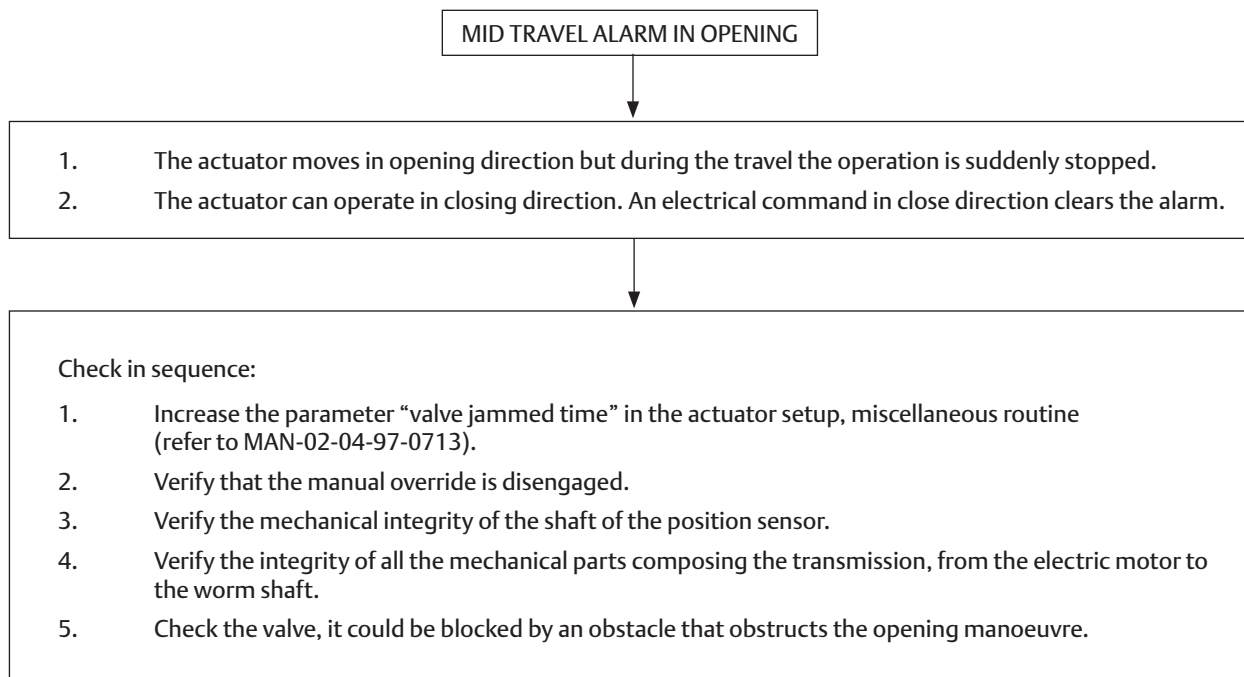
2.2.7 Alarm on Local Display: Position Sensor (Hardware 11 or Hardware 12)



2.2.8 Alarm on Local Display: Speed Sensor



2.2.9 Alarm on Local Display: Mid Travel Alarm in Opening



2.2.10 Alarm on Local Display: Mid Travel Alarm in Closing

MID TRAVEL ALARM IN CLOSING



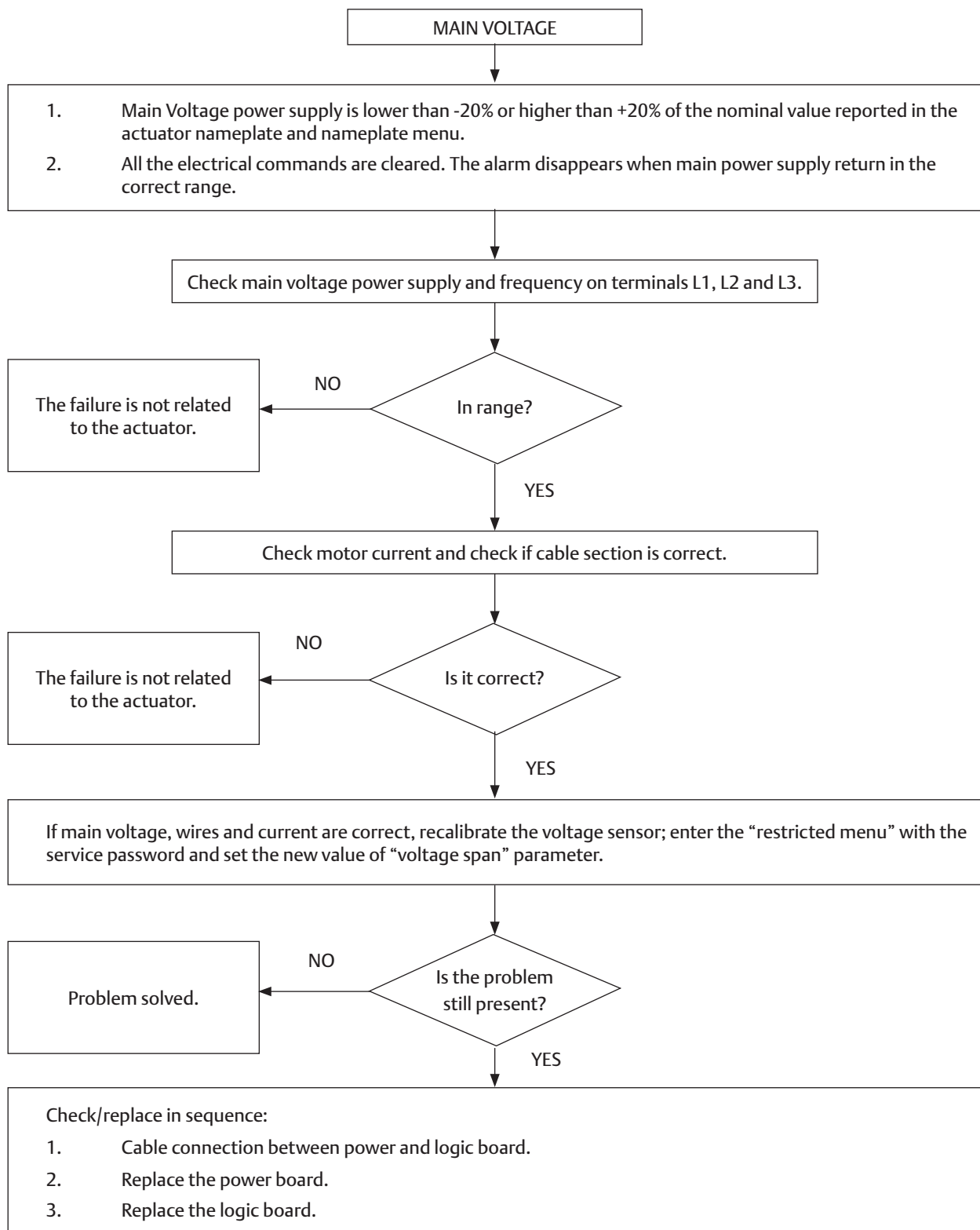
1. The actuator moves in closing direction but during the travel the operation is suddenly stopped.
2. The actuator can operate in opening direction. An electrical command in open direction clears the alarm.



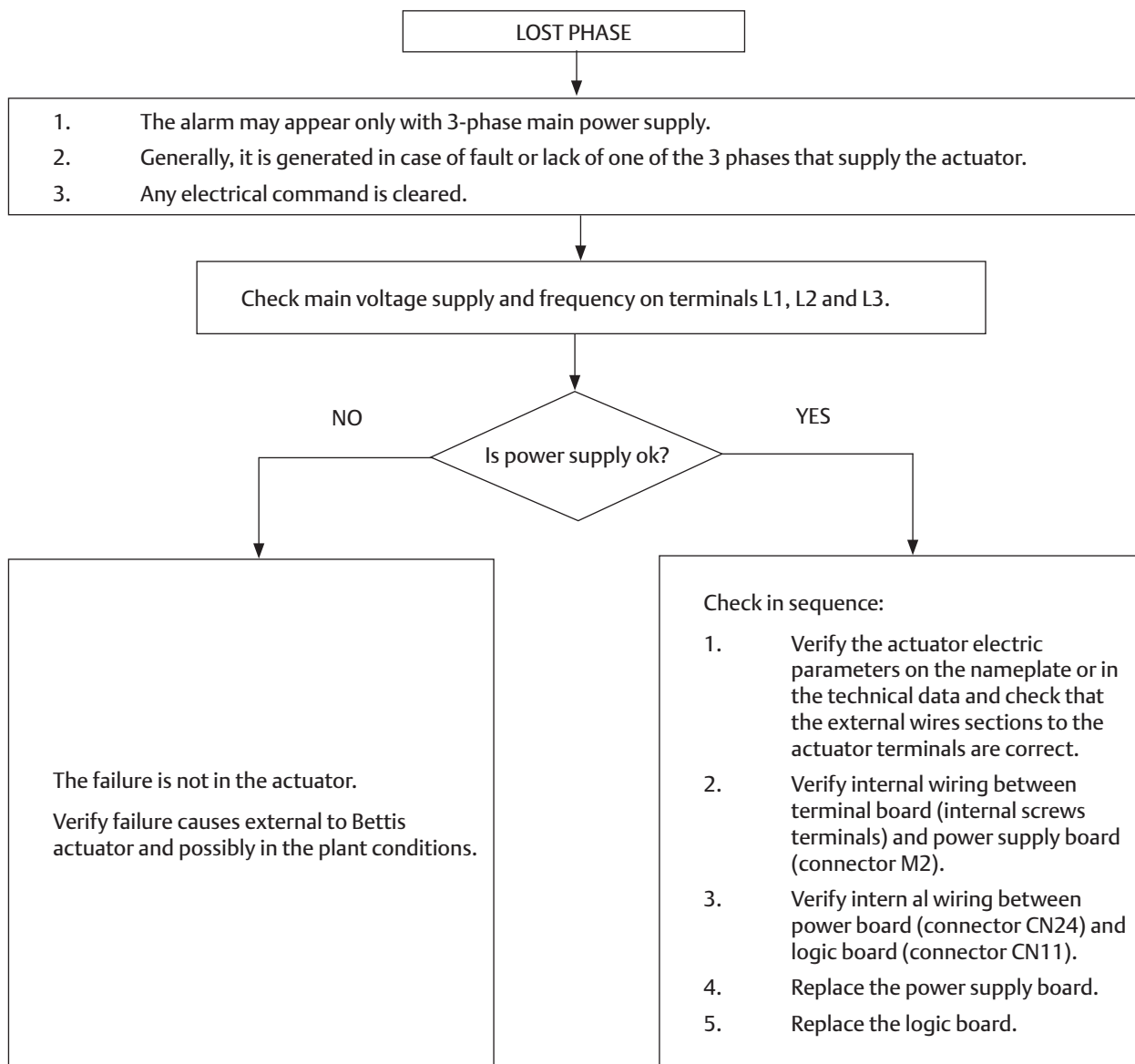
Check in sequence:

1. Increase the parameter “valve jammed time” in the actuator setup, miscellaneous routine (refer to MAN-02-04-97-0713).
2. Verify that the manual override is disengaged.
3. Verify the mechanical integrity of the shaft of the position sensor.
4. Verify the integrity of all the mechanical parts composing the transmission, from the electric motor to the worm shaft.
5. Check the valve, it could be blocked by an obstacle that obstructs the closing manoeuvre.

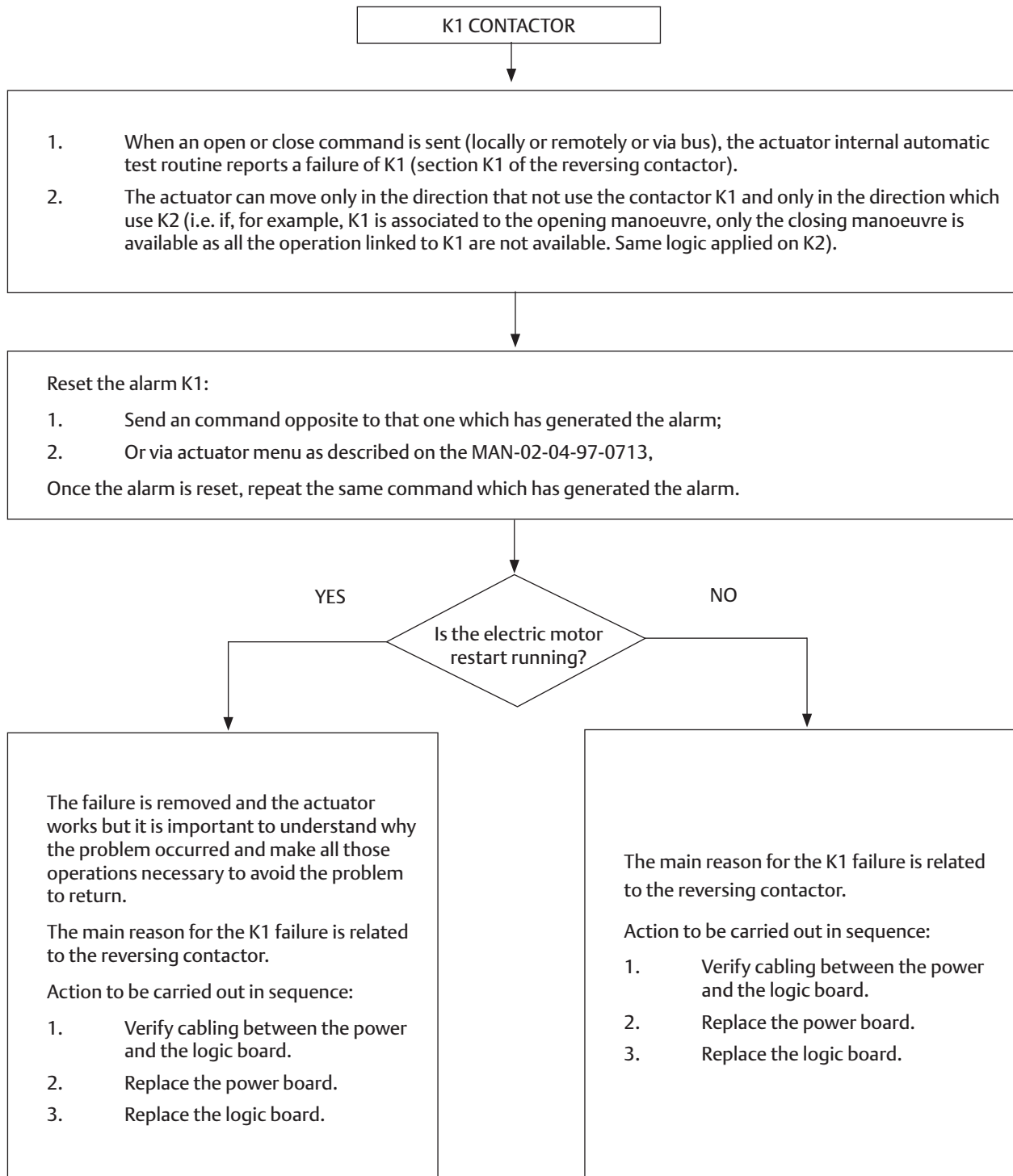
2.2.11 Alarm on Local Display: Main Voltage



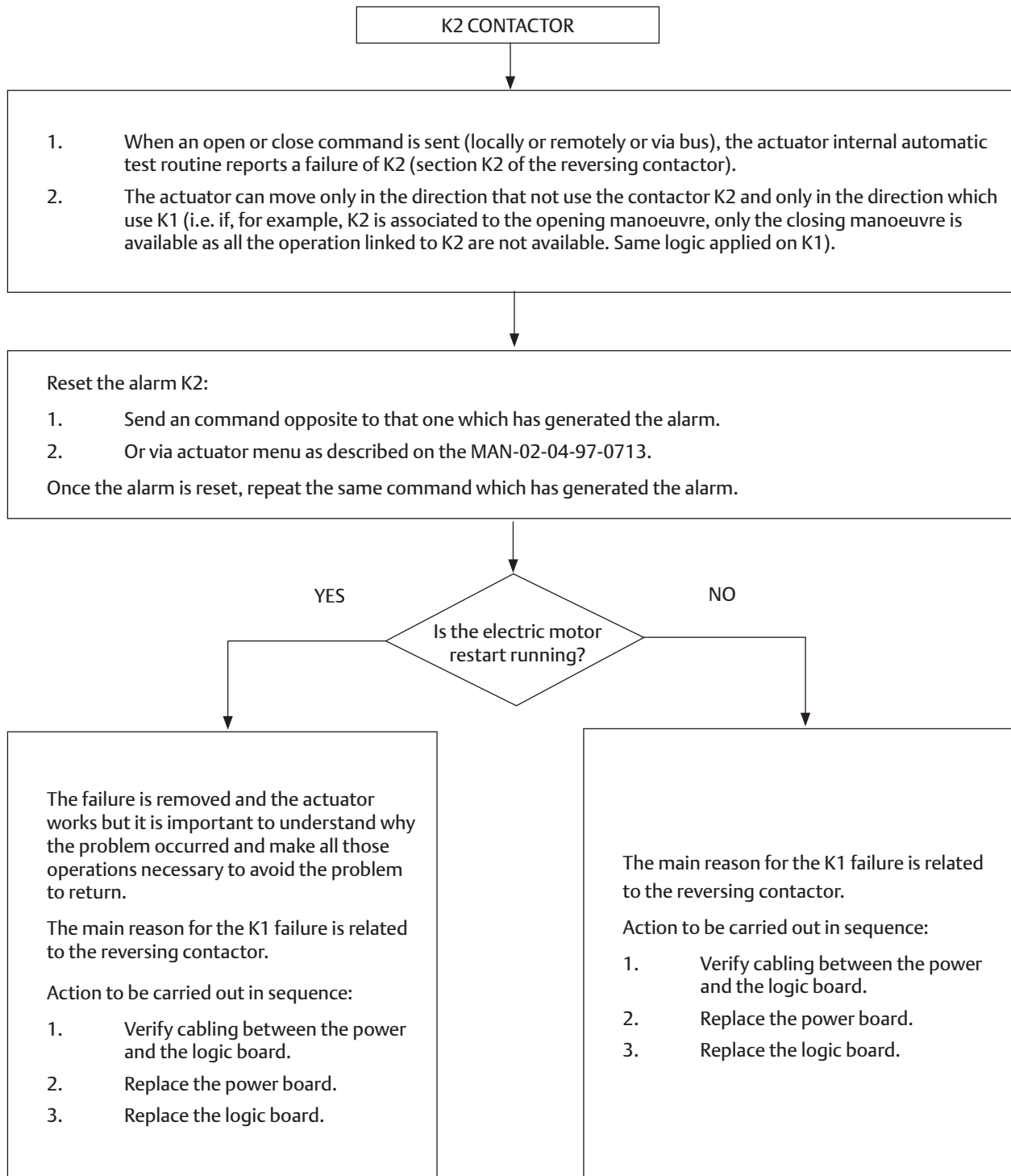
2.2.12 Alarm on Local Display: Lost Phase



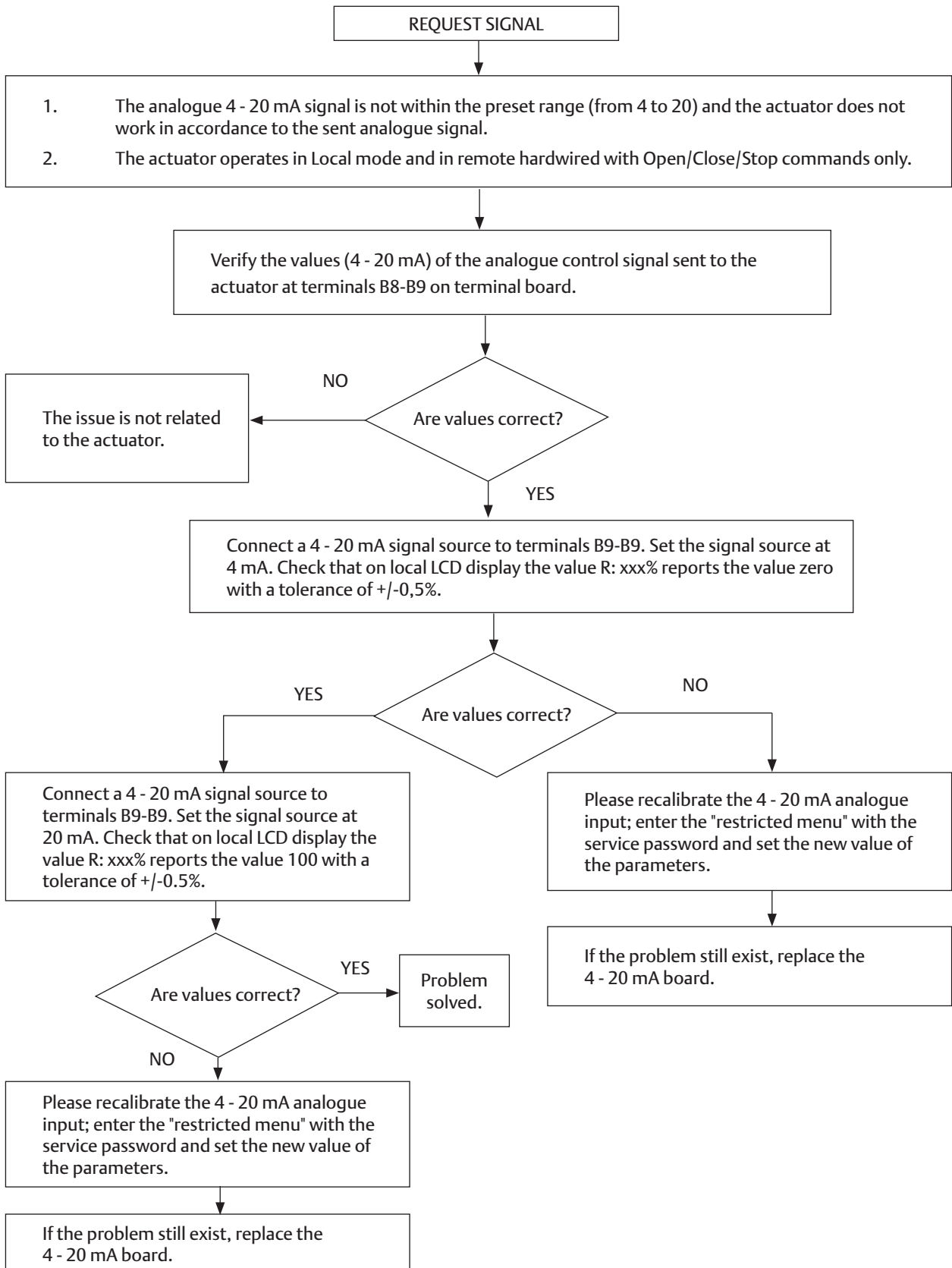
2.2.13 Alarm on Local Display: K1 Contactor



2.2.14 Alarm on Local Display: K2 Contactor



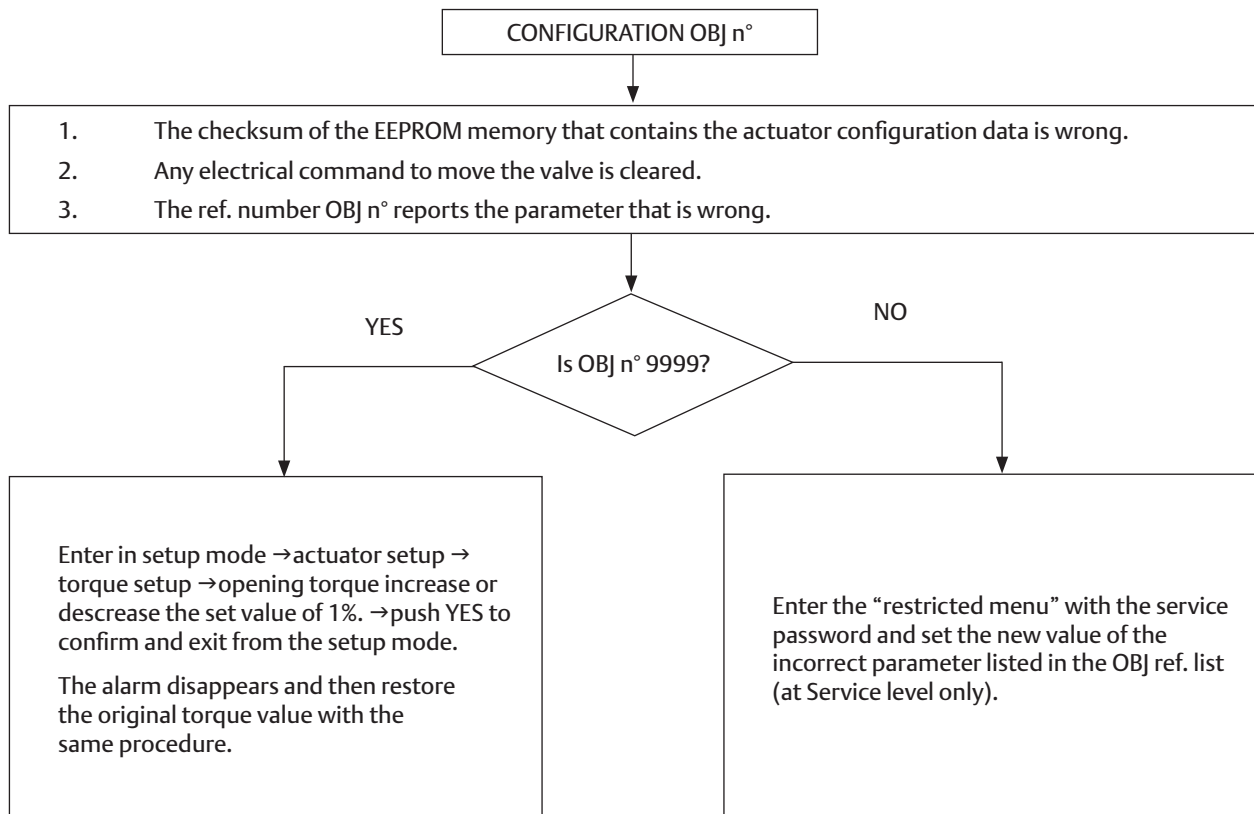
2.2.15 Alarm on Local Display: Request Signal



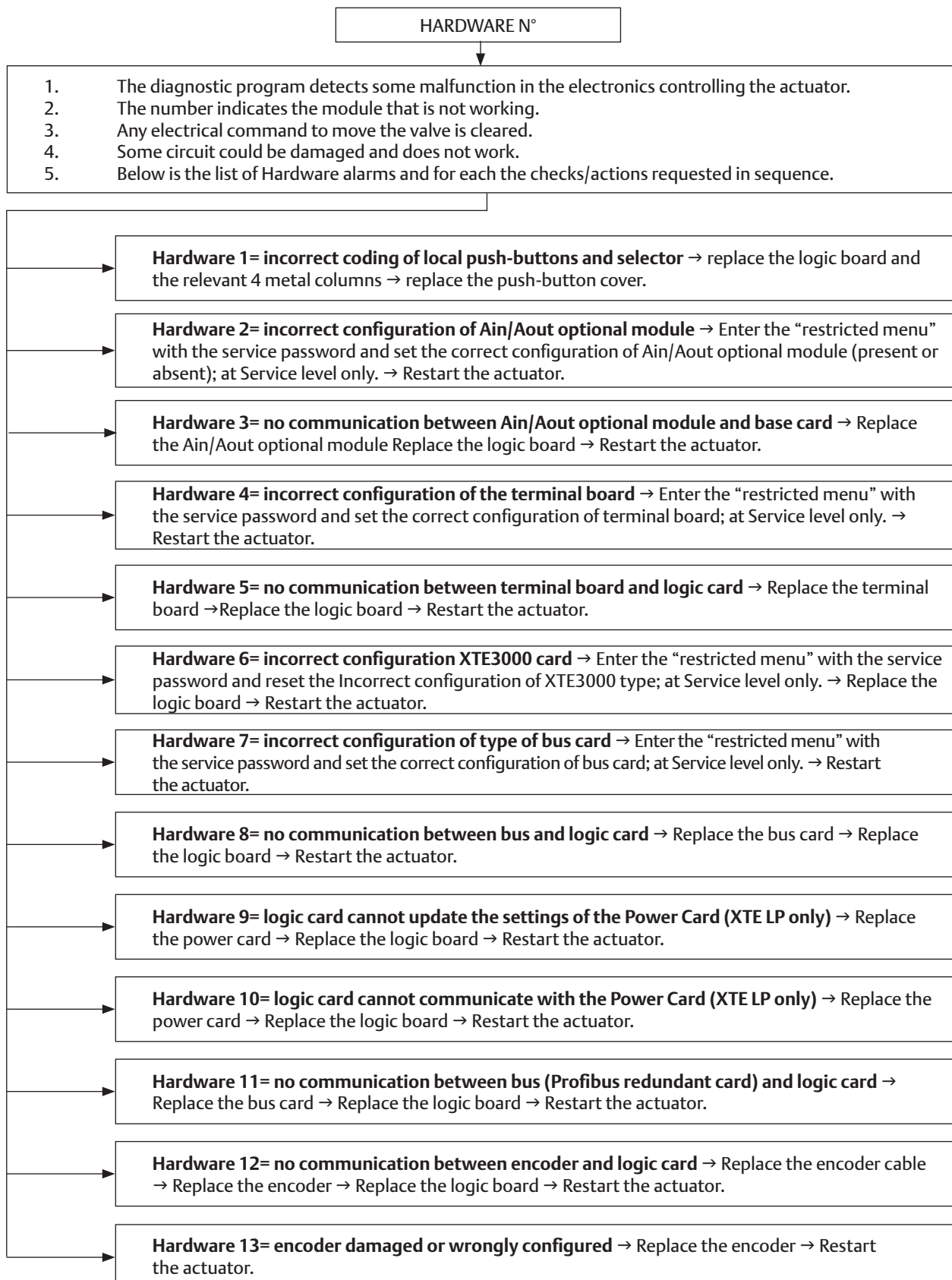
2.2.16 Alarm on Local Display: Low Lithium Battery

The voltage of the lithium battery is too low (only detected if the battery is present and the relevant parameter of the miscellaneous routine is set to "present"). The electrical commands to move the valve are available. It needs to change the 9V Lithium battery (see instruction below to change battery on MAN-02-04-97-0713).

2.2.17 Alarm on Local Display: Configuration OBJ n°



2.2.16 Alarm on Local Display: Hardware n°



2.3 Warning Description

Warning status does not affect the XTE3000 operation, it only indicates that some variable is near to critical value and could in future generate an alarm. It is better to fix the warning as soon as possible.

2.3.1 Warning on Local Display: High Torque in Closing (Near to Maximum)

The measured torque is near to maximum torque minus 10%.

1. Check the valve and the torque needed to move the valve.
2. Check the torque limits in Actuator Setup, Stroke limits and torque setup.
3. Increase the torque limit only if valve stem can accept more torque/thrust/without any damage.
4. Repeat "stroke limit" setup procedure in case of change of torque limit and valve closes or open by torque.

2.3.2 Warning on Local Display: High Torque in Opening (Near to Maximum)

The measured torque is near to maximum torque minus 10%.

1. Check the valve and the torque needed to move the valve.
2. Check the torque limits in Actuator Setup, Stroke limits and torque setup.
3. Increase the torque limit only if valve stem can accept more torque/thrust/without any damage.
4. Repeat "stroke limit" setup procedure in case of change of torque limit and valve closes or open by torque.

2.3.3 Warning on Local Display: Internal Temperature (Near to Maximum)

The temperature inside the actuator enclosure is higher than 80 °C or lower than -35 °C. Any electrical command is cleared. The warning disappears when temperature is within the range +80 °C, -35 °C.

Check ambient temperature.

2.3.4 Warning on Local Display: Main Voltage (Near to Limit)

Main voltage lower than -15% or higher than +10% of the value stated in the nameplate menu.

1. Check main voltage supply and frequency on terminals L1, L2 and L3.
2. Check current of motor and verify that wires section is correct.
3. Check internal wiring between terminal board and power supply module.
4. When main supply return in the correct range the warning disappears.
5. If main voltage, wires, current are correct it is necessary to recalibrate the voltage sensor.
6. Enter in the RESTRICTED menu by the service password and set the new value of the parameter "voltage span".
7. If also the above check does not resolve the problem could be in TV transformer on the power card or in the cable between power module and control module. It needs to change the power module/control module.

2.3.5 Warning on Local Display: Contactor Cycles

The contactor has reached the maximum number of cycles. The power card that have the contactors on board should be changed as soon as possible.

2.3.6 Warning on Local Display: Maintenance Request

The date for the scheduled maintenance has expired. It needs to carry out maintenance operation and then to set the next maintenance date in the MAINTENANCE menu, maintenance date, (see Installation, Operation and Maintenance Manual, MAN-02-04-97-0713).

2.3.7 Warning on Local Display: Wrong Stroke Limit

The function that controls the end of travel limits detects a wrong end of travel condition. It needs to recalibrate the stroke limits (see Installation, Operation and Maintenance Manual, MAN-02-04-97-0713).

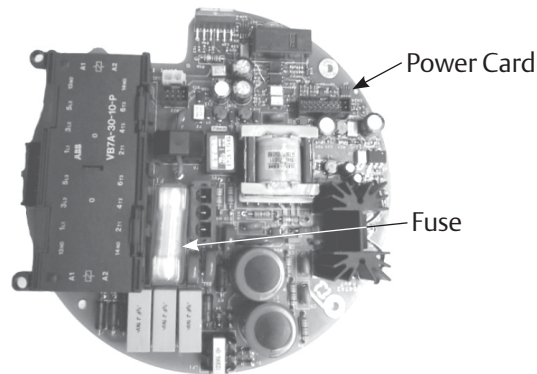
2.3.8 Warning on Local Display: BUS

The function that the BUS detects no message within fixed time. Check bus messages.

2.4 The Electronics Does Not Switch on When Powered

1. Check that the value of the main voltage on terminals L1, L2, L3 is correct.
2. Check the fuse mounted on the power card. Replace it if burnt.
3. If the fuse is OK, check the wires between terminals L1, L2, L3 and connector M1 of the power card. If it is correct, replace the power card.

Figure 4



2.5 DC Output Voltage Not Available at the Actuator Terminals

1. Switch the main power supply off and disconnect all wires from terminals B1-B2 and C1.
2. Switch the main power supply on and check if the voltage on the terminals B1-B2 and C1 is between 23 and 27 V DC. If the voltage is correct, check the external wiring and the electrical load. It should not exceed 4 W.
3. Check internal wiring between power card and terminal board. If the voltage is not correct, replace the power card.

Figure 5



2.6 The Actuator Does Not Work with Remote Controls

1. Move the 3-position selector to LOCAL and check that the actuator works with local controls.
2. Move the local selector to REMOTE. If the ESD signal is active, the alphanumeric display indicates “ESD ON”. Check the signal on terminals C3 and C4 and adjust the ESD configuration. If the alphanumeric display indicates “INT”, an interlock control is present. Check the signal on terminals B3, B4 and B5, and adjust Interlocks configuration.
3. Check that:
 - a. The wiring to terminals B1-B2 and C1 is correct.
 - b. There is no short-circuit between wires.
 - c. The electrical load does not exceed 4 W.
 - d. If external voltage supply is used check that the value is in the range 20-120 V AC 50/60 Hz or 20-125 V DC.

2.7 The Motor is Very Hot and Does Not Start

1. Check that no alarm other than motor overheating is present.
2. Wait until the motor cools down and the normally closed contact of the thermal switch automatically resets before trying to operate the actuator again.
3. Check that the number of operations per hour and their duration is suitable for the actuator service (see the nameplate menu).
4. Check that the valve operating torque is within the range of the unit’s designed operating torque.
5. Check current absorbed and compare con the value stated by nameplate.

2.8 The Motor Runs but the Actuator Does Not Move the Valve

In case the local display does not change the valve position indicators:

1. Check that the manual declutch lever is not stuck in manual operation position.
2. Rotate the handwheel a few degrees to remove all possible sticking between the handwheel and the drive sleeve.

In case the local display changes the valve position indicators:

1. Verify the stem nut correctly fits in the actuator base.
2. Verify the stem nut has sufficient engagement with the valve stem.
3. Verify the key correctly fits in bore/keyways applications.
4. Check that the valve works in manual operation. If not, it is necessary to check the manual control area as follows:
 - a. Loosen the handwheel security dowel.
 - b. Remove the handwheel.
 - c. Remove the cover supporting the handwheel.
 - d. Check the integrity of the internal parts.
 - e. Proceeding with the assembly, follow the reverse order of the disassembly.
 - f. Make sure there are no foreign bodies. Pay attention not to damage the O-ring seals.

Figure 6



Figure 7

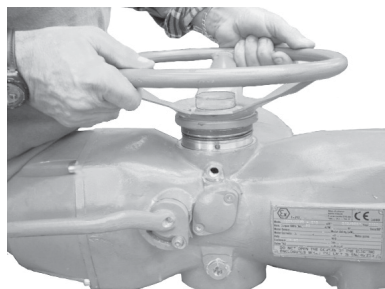
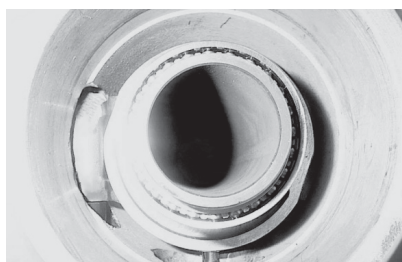


Figure 8



2.9 The Manual Override Cannot Be Engaged

In case the engagement of the lever is too difficult, check whether the drive sleeve is stuck and proceed as follows:

1. Open the cover.
2. Try to move the drive sleeve by a screwdriver.
3. Reassemble the cover.

Figure 9

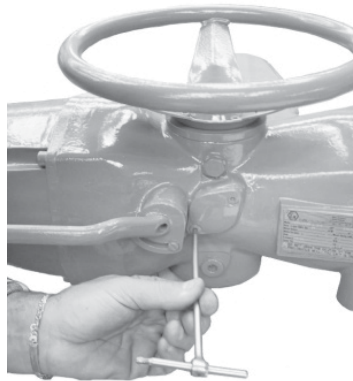


Figure 10



2.10 The Valve Does Not Seat Correctly

1. If the valve is stopped by the torque limit in closing, increase the actuator output torque limit.
2. If the valve is stopped by the position limit in closing, check that the valve reaches its seat position, then readjust the setting of the position limit.
3. The internal trim of the valve may be damaged.

2.11 Excessive Torque for Valve Operation

1. Clean, lubricate and check the valve stem.
2. Valve packing too tight: loosen the gland bolt nuts.
3. Coupling type “A”: tight fit between bush and stem: increase the thread clearance on the drive coupling.
4. Coupling types “B1”, “B2”, “B3” and “B4”: ensure there are no axial forces on the valve stem by leaving an adequate axial clearance between the stem and the drive bush.
5. Check that all transmission shafts, universal joints or bulkhead passages have sufficient lubrication and check that the transmission shafts are not bent.
6. Check that the internal valve trim or the reducer gears are well lubricated and not damaged.
7. Check the alphanumeric display for diagnostic messages, and proceed with the suitable corrective actions as described in this manual.

2.12 The Actuator Does Not Stop in Fully Open or Fully Closed Position

1. Check that the actual open and close positions of the valve respectively correspond to 100% and 0% on the actuator display.
2. Make sure that the torque and travel limits are correctly set (see Installation, Operation and Maintenance Manual, MAN-02-04-97-0713).

2.13 The Numeric Position Display Indicates “---”

It is necessary to recalibrate the stroke limits (see Installation, Operation and Maintenance Manual, MAN-02-04-97-0713).

2.14 The Electrical Power is off and Numeric Display is Off

The 9 V Lithium batteries is discharged or is not present or is configured as “absent”.

1. Check that battery is really discharged.
2. Check current absorbed from battery and then change logic card.
3. Check the battery configuration (see Installation, Operation and Maintenance Manual, MAN-02-04-97-0713).

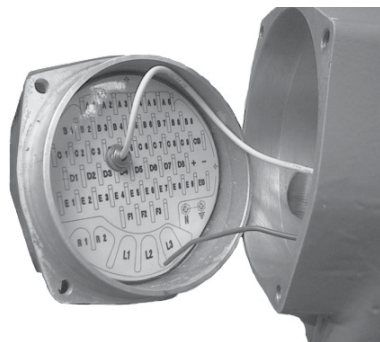
2.15 Replacement of the 9 V Lithium Battery

⚠ WARNING

Since the control and terminal board compartments contain a 9 V and 3.6 V lithium batteries, only open it in safe area. If the actuator is located in a hazardous area, a “hot work” permit must be obtained unless the actuator can be moved to a non-hazardous area.

Isolate the main supply to the actuator and all other control voltages. Open the terminal boards cover.

Figure 11



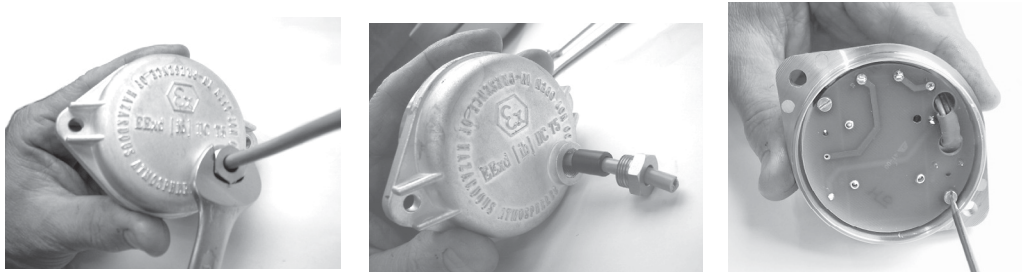
Disconnect two wires (+) (-) from the main board. Bring the cover to a safe area. When in a safe area: Remove the label.

Figure 12



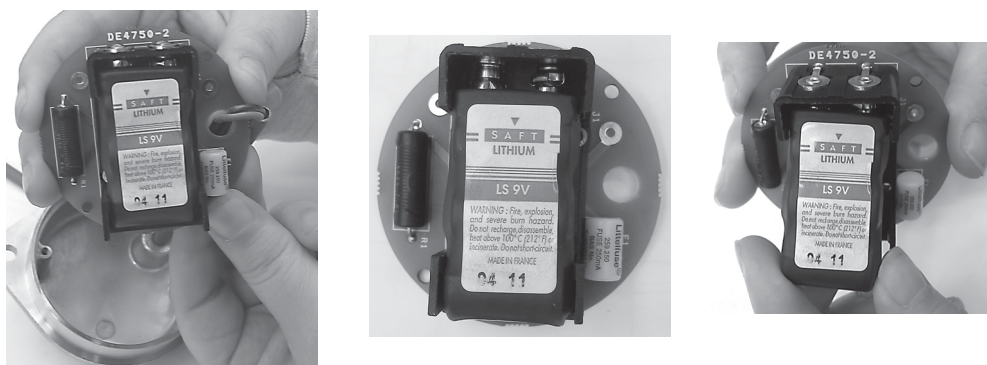
Remove the battery cover.

Figure 13



Replace battery.

Figure 14.



NOTICE

The new battery must be: Lithium LS 9 V manufactured by SAFT.

2.16 Logic Card of XTE3000

The connector is made of two pieces, header and crimp housing. The header is welded on the printed circuit board, the crimp housing is connected to wires. Due to mechanical block, to disconnect the crimp housing from header can be difficult and could damage connector or wires.

Figure 15

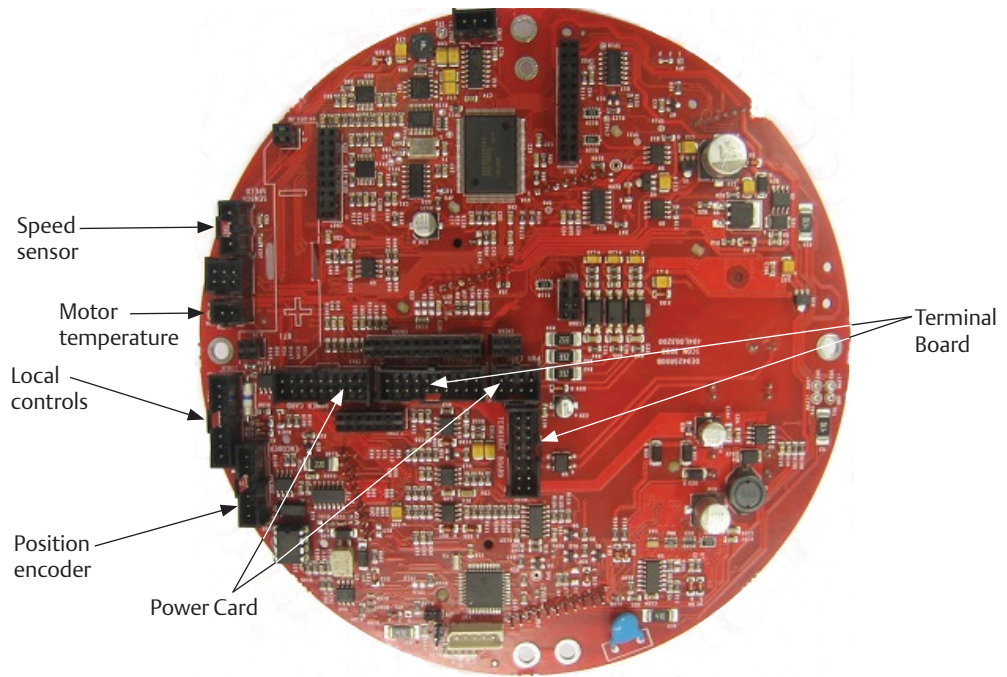
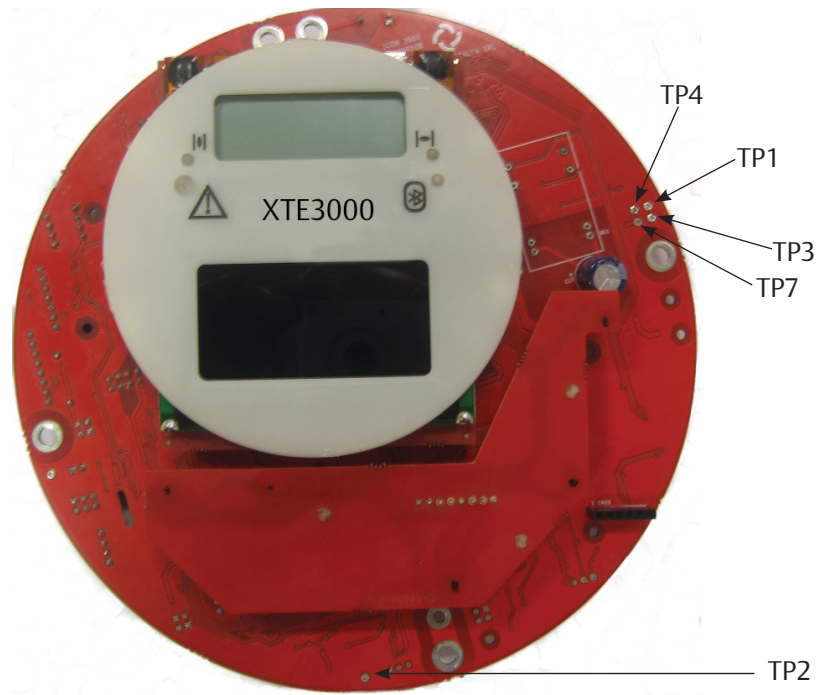


Figure 16



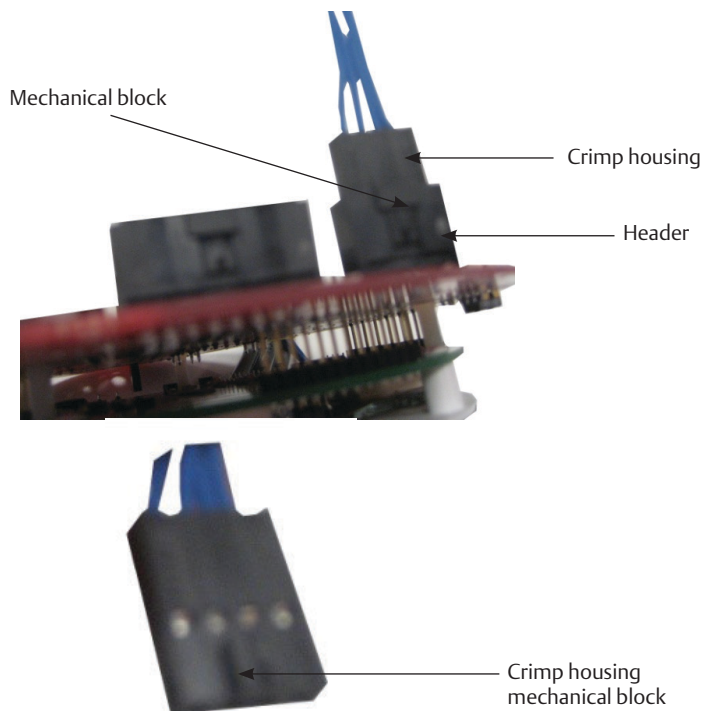
Test Points:

- TP1: 0 Vm
- TP2: 3.3 Vh8
- TP3: 13 Vm
- TP4: 12 Vm (in case of power supply by DC/DC converter)
- TP7: 5 Vm

2.17 Instruction to Disconnect C_GRID Connectors

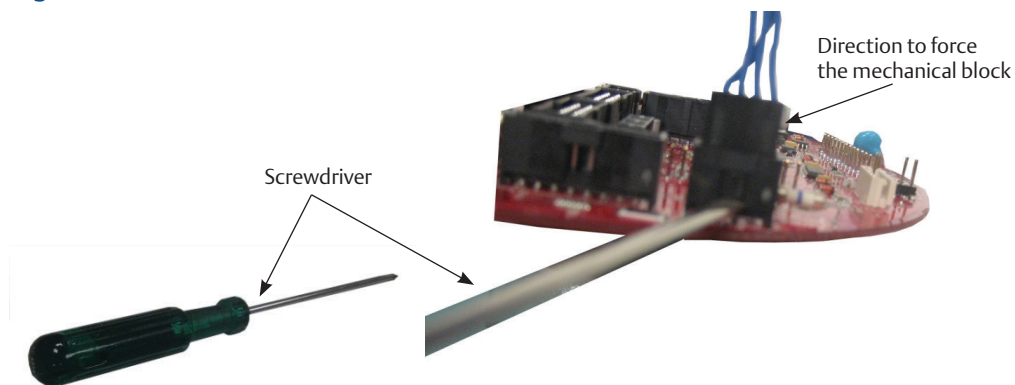
The connector is made of two pieces, header and crimp housing. The header is welded on the printed circuit board, the crimp housing is connected to wires. Due to mechanical block, to disconnect the crimp housing from header can be difficult and could damage connector or wires.

Figure 17



Disconnection between header and crimp housing can be helped by using a screwdriver. By the screwdriver, force the mechanical block in the direction indicated in Figure 18 until the crimp housing is free from header.

Figure 18



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